The author(s) shown below used Federal funds provided by the U.S. Department of Justice and prepared the following final report:

Document Title: **Correctional Operations Trend Analysis System (COTAS) System Summary**

Author(s): **Florida Department of Corrections**

Document No.: **247030**

Date Received: **June 2014**

Award Number: **2006-IJ-CX-K007**

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NIJ

Correctional Operations Trend Analysis System (COTAS)

System Summary

Florida Department of Corrections

This project was supported by Award No. 2006-IJ-CX-K007, awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this publication/program/exhibition are those of the author(s) and do not necessarily reflect those of the Department of Justice.

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The Beginning

The idea for the Correctional Operational Trend Analysis System (COTAS) came from an incident in the late 1990's at a Florida Department of Corrections (FDOC) institution that resulted in an inmate sit-down work strike. Institution administrators discovered the inmates were upset with the sudden sharp increase of Disciplinary Reports being given to the inmates from the Security staff at the institution for minor infractions. Further investigation revealed that the reason for the dramatic increase over the past three months was due to the policy interpretation from the new Colonel at the institution. As anyone in the Correctional field knows, these types of incidents can potentially escalate into serious violent incidents very quickly if not addressed immediately.

As the Department's Bureau of Research and Data Analysis and the Office of Institutions staff began to explore a way to alert the institution administrators of such sudden or drastic changes to the patterns the concept for COTAS was formed. Staff worked together to determine how the advances and concepts in crime mapping could be adapted to Florida's Correctional System. FDOC gathers tremendous amounts of data on every significant aspect of correctional management of inmates, institutional procedures and processes, facilities operations and staff. The challenge was how to systemically utilize cross-functional data and trend analysis to effectively, efficiently and safely address all aspects of institution management. Prior to receiving the National Institute of Justice grant to develop COTAS, FDOC invested significant financial and human resources to initiate the research for a system to provide this data to our staff in an format that would allow a quick overview with potential problem area highlighted.

FDOC began joint application design sessions in 2001 which allowed discovery of the first set of indicators that would be used in this project. A test release that was developed in 2002 displayed a relatively small set of data in simplistic and unassuming table form. Although rough and incomplete, this was easily and informally used. While the second expanded release was being developed it became apparent that a more user friendly presentation of the data would need to be developed. Also using a data warehouse would be a better approach for the project. Unfortunately, FDOC did not have any in-house expertise with the data warehouse technology.

As the FDOC did not have the staff or funding in our budget to develop a system using a data warehouse, the search for research grant opportunities began. Upon finding the National Institute of Justice's Office of Science and Technology's 2006 solicitation, the Department applied and was awarded a grant for the development of COTAS. The purpose of this application is to create a correctional crime mapping and information management system that monitors cross-functional operations and can be quickly viewed by different levels of correctional management.

The Creation of COTAS

With over one hundred thousand inmates the FDOC is the third largest state correctional system in the nation, maintaining records back to the 1970's. The Department has many different

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computer systems on both mainframe and client-server platforms. The largest data source is the Offender Based Information System (OBIS), which is a mainframe system. Managing such a large system, historically correctional administrators have had to spend a great deal of time wading through a variety of computer systems and paper reports, cross-checking and analyzing data in their heads, trying to identify the warning signs of potential operational problems in their area of responsibility.

FDOC needed an application that would enable corrections personnel to analyze large amounts of violent and non-violent event inmate data that was located in different computer systems. In addition, it needed the ability to use inmate and facility attributes to identify when characteristics previously associated with violence are converging to form potentially dangerous conditions. Finally, FDOC needed to identify trends, patterns and areas of concern within specific units, institutions or statewide.

FDOC's Bureau of Classification and Central Records, Bureau of Research and Data Analysis and Office of Information Technology worked together to identify the predictors of violent and non-violent events. The Bureau of Classification and Central Records limited the selection of predictors of violent events to those that were well-defined, easily understood by the users and significantly predictive of disruptive events. Key data elements were identified using five years of monthly snapshot data of inmates, facility, and staff characteristics as well as input from prior literature and correctional administrators. The statistical package SAS was used to determine the best inmate predictors of violent events by facility category through regression analysis. Checks of multi-collinearity were conducted to remove duplicative or highly-correlated predictors. A final list of significant predictors was provided to the programmers for the development of the predictive models.

To meet these specifications, the FDOC collaborated with Idea Corporation to develop a data warehouse, COTAS applications, and the COTAS interface. Data was pulled into the data warehouse from a number of FDOC databases including:

- OBIS (Offender Based Information System): a centralized mainframe hierarchical data store used to maintain and record offender/inmate records;
- FAST (Facility Access Secure Tracking): a centralized and distributed server-based data store to maintain and record the occurrence of inmate visitation and inmate volunteer activity;
- IGLOGS: a centralized server-based data store used to maintain and record investigative data by the Department's Inspector General's Office and inmate grievance data;
- MINS (Management Information Notes System): a centralized mainframe hierarchical data store used to maintain and record staff/offender incidents throughout the Department;
- Inmate Gang Database: a centralized server-based data store used to maintain and record inmate/offender gang activity;

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- Use of Force Database: a centralized server-based data store used to maintain and record whenever a staff member uses force against an inmate or offender.

The data warehouse serves as the central data source for the calculation of both COTAS historical and predictive statistics. The Microsoft SQL Server 2005 database software platform was used because it allowed for the integration of Microsoft Data Mining software and could be purchased and maintained at a lower cost to FDOC relative to other data mining software on the market.

A look at COTAS

COTAS consolidates historical and current data with a predictive scoring system and makes it readily available through dashboards and reports. This information is presented in ways that increase the likelihood of spotting potential problems that might otherwise go unnoticed for some time in organizations where information is in different systems on multiple platforms and no predictive scoring system exists. Once you spot a concern, deeper analysis can be conducted to determine if any action needs to be taken to alleviate an existing issue or avoid future issues.

COTAS provides the regional and facility administrators with two types of statistics, namely historical and predictive. On the screenshot below, the historical data which displays inmate data from the last thirty days data is represented on the gauges on the top line. The predictive data uses data from the past twenty years in it predictive calculations and is represented on the life savers on the second line.

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Historical Data

The historical data is the starting point in the COTAS system. The data represented on the gauges allow the following category to be investigated:

- Number of violent events
- Predicted violent events
- Central Office grievances
- Disciplinary reports
- Field grievances
- Investigations
- Use of force
- High-profile inmates

The events can be investigated and summarized in several ways. Most events can be selected and expanded in the details of the item by displaying details of the report for the event. The thirty day violent event history reports the number of events over the last thirty days on each individual day. This allows the staff that is investigating an increase in their score to pinpoint which day caused a change in their rating. There is also an inmate report that provides a summary of all events in the data warehouse for the individual inmate.

The gauges are displayed using a green, yellow, red color scheme similar to a stoplight. A green rating indicates that the number of events in that category is in the expected range. Gauges in yellow are above the expected range and could merit investigation into recent events. Red is outside the expected range of events. COTAS is not a substitute for institution administrators but a tool that assists in compiling the data from various systems and displays an alert of a potential problem. The green, yellow, red color scheme is only a guide for the institution administrators, and only implies that there is a potential problem. There may be a valid reason for the yellow or red rating. Institution administrators have to read and interpret data to determine what and if any action is needed for the rating.

The determination of whether an institution's event count falls into red, yellow or green depends on thresholds that have been set up for each institution based on its facility type and category. This feature allow for the weighting of like institutions so they can be measured against realistic expectations. This ensures that the attention is drawn to the facility that needs it the most.

Graphs display the event counts by category for the past twelve months. This trend view provides insights into the functioning of that institution or region, although it will be necessary to know more information about the numbers to identify any action that should be taken.

The institutional dashboard shows the violent and non-violent categories for the past thirty days. The categories tabs to re-sort the data displayed on the screen are by Bed Mission (youthful offender, suicide watch, etc.), Dorm, Primary Work Assignment, etc. By clicking the tab, you can see if events are concentrated in a particular bed mission, dorm, work assignment, etc.

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Predicting and mitigating risk

The predictive graphics, which are displayed on the second line in the screen shot above, are often referred to as life savers, because they bear close resemblance to the Life Savers candy. The green-yellow-red color scheme continues with the predictive graphics, because they display the relative amount of risk for violent events going from green to red. Each life saver is broken down into an inmate predictor and facility predictor.

The inmate predictor life saver lists all of the institutions in the region by order of risk. Drilling down into the facility is a listing of inmates that is based on the individual inmate risk score. The inmate risk score is calculated with advanced predictive algorithms that factor in the inmate's number of violent events, the number of months since the last violent event, race, age, gender and time served. These characteristics are correlated with the historical violence tendencies of others with comparable characteristics to calculate an inmate risk score. Inmates that have transferred into the institution within the past thirty days have a highlighted risk score. This allows facility staff to easily review inmate risk scores of the new arrivals.

The data used in the calculation of the inmate risk score can be displayed in two ways. For a quick view, the user can mouse over the inmate risk score and a popup box will display a summarized view of the data. A report with more detail is displayed by clicking on the inmate risk score. This report includes inmate's demographics and assigned institution information along with details of violent and non-violent events that attributed to the inmate risk score.

The facility predictor life save is based on gangs at the facility. The number of gang members and associates, and the number of different gangs within the institution both attribute to the facility rating. Category tabs to re-sort the data displayed on the screen are different for this predictor. The tabs are gang, dorm, primary work assignment, gang membership status and rank in gang. The ability of the sort tabs assists the institution administration in managing gang members and suspected gang members within their facility. COTAS highlights rival gangs or a high concentration of a single gang in work assignments and dorms. This allows the facility's administration to spread out the gang members without mixing rival gang members to avoid gang related incidents within their facility.

FDOC would like to expand the facility predictor in the future beyond the scope of the NIJ grant. One of the primary areas of interest is employee data. This data would include but not be limited to years in service, disciplinary action, employee arrest, etc.

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Everyday use of COTAS

Using DOC's large collection of historical and real-time data regarding characteristics about individual inmates, violent and non-violent incidents, and environmental characteristics of institutions, COTAS provides correctional administrators with trend analysis and risk assessment of inmates' involvement in violent events. COTAS users can view the historical and predictive data either by region or individual facility. The home screen displays the events and predictive rankings by the Department's Institutional regions. With a click of the mouse the data and rankings for individual facilities are displayed in order of ranking from red to yellow to green. In an effort to rank like facilities, ranking thresholds are determined by categories. To avoid any confusion in the ranking there is a link on the screen which explains the thresholds for the color ranking.

A report of high profile inmates is available by region or facility. High profile inmates are individuals of particular concern for a variety of reasons. This is a quick view of the inmates that meet this criteria and an abbreviated description of why the inmate was deemed high profile. The regional view gives a total count by facility and the facility view list the individual inmates with their data.

The primary daily focus of the Wardens and their staff of historical data is the facility view. It allows them to see any dramatic changes as it occurs and gives them time to investigate the cause and react if needed in a timely fashion. Another view favored by facility staff is the facility list sorted by category. This allows them to compare the rankings of their facility with the other facilities in their category (work camps, close management, etc.). Next would be a scan of the Inmate and Facility predictors, for a review of the new inmates with high inmate risk scores and the events that earned the inmate's high score. Completing their review of COTAS would be a review of their facility predictors and the gangs within their facility.

Central office and regional staff mostly focus on facilities that are ranked red. They may drill down into the facility data reviewing the individual event gauges in the red and might address any questions they have about the event counts with the facility administration.

Installing COTAS at another agency

COTAS is not 'plug and play' software that can be simply or routinely installed at another agency. The installing agency will need a compatible computer platform to support COTAS. COTAS can only consolidate information that is available in the agency's computer systems for the management of inmates and facilities. Consequently, the implementation of COTAS would involve modifying the COTAS data warehouse and computer code to the data available at that agency.

Anyone interested in finding out more information regarding COTAS can contact:

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